Occupational Therapy Assessment and Assistive Devices for Driving Rehabilitation: Introduction of the Practice of Driving Rehabilitation Centre in University of Sydney


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Abstract

Introduction: Driving is not only just a means of transportation but also regarded as the occupation for community participation or leisure activities. As the generation driving for many occupational activities gets old, the need of driving rehabilitation assessment and specialized training for the physically or cognitively disabled has increased. However, the driving rehabilitation system is not well established in Korea yet, it would be helpful to speculate the system in the developed country such as Australia.

Body: Driving rehabilitation centre in University of Sydney provides clinical assessment and on-road assessment for assessing the driving ability of people with physical and cognitive disabilities. The clinical assessment includes interview, physical test, skin sense test, proprioception test, coordination test, balance test, general vision test, and visual recognition slide test. After completing the clinical assessment, on-road test is conducted under the supervision of an occupational therapy, a driving instructor, a policeman. According to the result of assessment, the occupational therapist could either enforce specialized training session or prescribe the assistive devices for driving. Finally people with disability become able to drive again through appropriate assessment and further specialized training and assistive technology.

Conclusion: In conclusion, it is important to make the disabled drive and it would be related to participation of community or leisure activities in further. Therefore, appropriate assessment and driving rehabilitation system is needed to be established in Korea as well.

Key Words: Assistive driving device, Australian driving rehabilitation service, Australian driving rehabilitation laws, Occupational therapist

INTRODUCTION

It is no doubt that driving has recently become a common activity of daily living for people. People drive own cars for the purpose of transportation and it consequently leads participation in community and lei-
sures activities (Stav, Pierce, Wheatley, & Davis, 2005). Issues relating to the ability to drive effectively after aging or injuries are concerned in many drivers with physical or mental limitation. Driving is a complex task as a serial result of sensory information inputs, cognitive processing, and motor outputs. Motor, sensory, cognitive components are interrelated to create a complex driving task. Thus, a driver’s suitability to drive should be assessed in diverse aspects. A client’s physical capacity, visual and perceptual function, and cognitive judgment are commonly assessed for safe and efficient driving (Cook & Semmler, 1991). In addition, personality or behavioral disturbance is carefully considered as an important factor that affects safe driving (Galski, Eide, & Williams, 1997). Psychological issues such as abrupt behaviors in drug/alcohol addition and impulsive disorder are likely to appear during driving. It could cause a victim of itself as well as other drivers on the road. Therefore occupational therapy assessment should be performed comprehensively to evaluate all factors of a driver. For this reason, driving assessment is conducted not only in clinical assessment but also in on-road assessment in a modified vehicle. In Australia, the clinical assessment is generally composed of initial interview, physical assessment, visual assessment, cognitive and visual perceptual assessment, and tests for searching, identifying, predicting, deciding, and executive functions. On the other hand, the operation of the vehicle, behavioral concerns, and vehicle consultation are considered in on-road assessment. Above all, driving rehabilitation service would be possible to be enforced within the legal system. In Australia, national legislation except Western Australia defines drivers’ responsibility that all driver are required to notify the driver licensing authority in their state of “any permanent or long-term injury or illness that affects his or her safe driving ability” (Road Traffic Act, 1993). That is, drivers may be liable under common law for continuing to drive knowing their condition, so drivers is usually referred by a physician or walk into the Occupational Therapy (OT) centre by themselves.

Those legal system and driving rehabilitation service makes it possible peoples with physical and cognitive disability to drive again. Specialized training session according to individual medical condition or prescription of assistive driving devices after assessment actualize to drive for the disabled. It would be valuable to scrutinize the driving rehabilitative service in Australia especially in the driving rehabilitation centre of University of Sydney (USYD DRC) in New South Wales to establish the driving rehabilitation service in Korea.

**SERVICE DESCRIPTION**

Driving assessment in driving rehabilitation centre of University of Sydney (USYD DRC) is originally separated in two parts which are clinical screening and on-road assessment. Clinical screening is composed of 8 sub-tests and these sub-tests comprehensively cover sensory-motor, perceptual, and cognitive functions. This paper will discuss the composition of assessment items and their rationale comparing with previous literatures.

1. **Interview**

First of all, the therapist has very casual interview with the client about medical condition, driving history, license status, accident, and job history. Even though the medical chart by the client’s physician primarily has been sent to the therapist, the therapist should identify the most related health condition and main complaint limiting to perform driving through the communication during the interview. In addition, driving goal should be set at this stage and vehicle consultation also should be followed to some extent.
2. Physical Test

Human capacity for safe driving mainly refers to physical ability in general. Motor ability is essential to manipulate the vehicle. Physical assessment in USYD DRC evaluates two parts of physical ability: Range of Motion (ROM) and muscle strength. The ROM is tested from the neck to feet. The ROM of each extremity and joint should reach the controls around the driver in a vehicle and also be enough to flex and extend to get in and out the vehicle. The muscle strength is tested by manual muscle testing. The therapist applies appropriate resistance which is not too strong nor too weak on key muscles of upper and lower extremities. The therapist subjectively determines the level of appropriate strength to operate a vehicle controls. It is commonly reported that 89 Newtons (20 pounds force) is the most proper intensity of strength (Mazer, Gelinas, & Benoit, 2004).

3. Skin Sense Test

It is known that sensory deficiencies affect on controlling a vehicle (Mazer, Gelinas, & Benoit, 2004). A vehicle’s controls including a stir wheel, a gear stick, and foot pedals should be manipulated without watching them. Thus, the awareness of intensity of pressure/power on a vehicle’s controls is associated with skins sensation.

Skin sensation tests are conducted in the condition of eyes closed. This test evaluates the sensation flowed from the touching sensory route other than the visual sensory route. The therapist touches some spots of forearms and hands in upper extremities and lower legs below the knees and feet in lower extremities. Then, the client is asked to point where are touched.

4. Proprioception Test

Proprioception is especially important in driving. When a driver drives on the road, the consciousness of a driver mostly focuses on visual stimulus beyond the front window such as pedestrians, other cars, and the road signs. Thus, the movement of arms and legs to handle a stir wheel and foot pedals are more likely to be automatically operated without visual monitoring. Proprioception to move extremities simultaneously operating controls without visual supervision should be assessed when driving (Mazer, Gelinas, & Benoit, 2004).

The therapist positions a client’s arms and legs and the client copies the position of extremities. Another form of test is that the therapist passively moves client’s one arm or leg and the client simultaneously moves the other side. In this sub-test, the client is asked to manipulate their extremities only using proprioceptive information for driving.

5. Coordination Test

The ability to dissociate and coordinate bilateral movement is necessary for efficient driving (Mazer, Gelinas, & Benoit, 2004). For example, the driver should be able to simultaneously manipulate a stir-wheel during controlling an accelerator or brake with a foot. Clients with brain injuries are usually suspected to have deficit of coordination. According to Mazer (2004), coordination test should include the following area: eye-hand coordination, eye-leg coordination, head-hand coordination, hand-leg coordination, leg-leg coordination. In driving, coordinating body parts with visual or proprioceptive information and also upper extremities with lower parts for pedals for efficient driving. Moreover, the therapist should focus not only on integrating movement of two parts at once but also on dissociating movements separately.

Assessment of coordination here in USYD DRC consists of eye-hand coordination and eye-leg coordination. These are tested by performing simple tasks such as tapping two dots with a fingertip and a
foot.

6. Balance Test

The balance of the trunk during driving is important especially for clients with upper level of spinal cord injury. A driver is required enough trunk stability in a dynamic vehicle.

The therapist push the client’s trunk with appropriate amount of force and the client must resist against the force applied by the therapist.

7. General Vision Test

Vision is the most frequently used sensory information when driving. Eye muscle movement, range of visual field as well as the neurological feature of eyes should be tested in vision test. Vision test can be divided into two parts. The one is how properly we see the objects such as acuity and the other is about how we process visual inputs in the higher perceptual stage. In general vision test, the general visual abilities such as visual acuity, pupil reflex against the light, the range of peripheral vision are examined. Furthermore, the issues related with vision such as double vision, blurred vision, and vision changes after accident are asked through the verbal interview.

8. Visual Recognition Slide Test

Driving is required the complex processing of sensory inputs and cognitive activities of the brain. The process of perceptual and cognitive information is occurred within dynamic and complicated road environment rather than simple and restricted condition, so that the specific assessment for perception and cognition should be used in driving assessment.

Visual Recognition Slide Test(VRST) is initially developed by University of Sydney and it is used in driving assessment for perception and cognition test. VRST is pictorial assessment and has about 20 photos reflected on Australian road condition. A client quickly screens the information on the picture and remembers them for seconds then should mention all road information to the therapist. A client should report information such as direction, location of vehicles and pedestrians.

ON-ROAD ASSESSMENT

Driving is not simple task but the real task in complex environment. Desk top assessment to identify the ability to drive safely is somewhat limited. Thus, on-road assessment should be included in driving assessment followed by pre-desk top assessment. The therapist during off-road assessment previously screen the client's ability to drive to some degree, then the therapist and a driving instructor assess the client’s condition to drive in the real traffic environment with the modified vehicle in some cases. The client is able to use either own modified car or a modified car in the centre. At this progress, the therapist should assess special considerations and make recommendation of assistive devices for driving in order to make it possible the client with physical limitation to drive. Some weeks or days of further training sessions for the client in terms of their deficits are also prescribed if necessary.

CONCLUSION

Occupational Therapy(OT) practice in driving rehabilitation has soared as top 10 emerging practice areas in the new millennium(Johansson, 2000). Legislative changes and professional competence should be established to provide the best service with clients at this point. Appropriate driving evaluation in OT should keep being developed and the introduction
of the best practice which has been already developed in other countries would be good sources for therapists in clinic. Furthermore, as providing the OT assessment service for driving rehabilitation, clients with physical or cognitive limitation become to drive again and further participate back in community or leisure activities. Driving rehabilitation assessment is not the service to restrict drivers with disability but it makes possible them to participate in driving through further driving training sessions or prescription of assistive devices according to individual condition. As a matter of course, those are based on the result of appropriate driving assessment considering clients’ disabilities. Finally, appropriate driving rehabilitation assessment would lead drivers with disabilities to drive with a modified vehicle and assistive driving devices.

REFERENCES


국문초록
운전재활을 위한 작업치료평가와 운전보조도구: 시드니 대학교 운전재활센터 소개

서론: 오늘날 운전은 이동수단으로서뿐 아니라 지역사회 활동 참여 및 여가생활에 있어서도 중요한 수단적 활동이 되고 있다. 운전자의 고령화가 진행될수록 운전능력과 밀접하게 관련된 시각, 지각, 인지, 운동 능력을 전문적으로 평가하는 시스템의 개발에 대한 필요성이 입구되나고 있다. 하지만 현재 우리나라 운전재활시스템은 아직 부족한 실정이며 선진국인 호주의 운전재활평가 시스템 및 운전재활 보조도구 평가 시스템을 소개함으로써 그 방향성의 제시하고자 한다.

본론: 호주의 시드니대학교 부속 운전재활센터의 운전재활평가 시스템은 기본적으로 치료실내 평가(clinical assessment)와 도로주행평가(on-road assessment)를 포함한다. 치료실내 평가에서는 클라이언트의 전반적 운전능력을 면담하고, 그 외에도 신체평가, 감각평가, 고유수용성감각평가, 협응평가, 균형평가, 시각평가, 시지각평가로 이루어진다. 치료실내 평가에서 통과가 되면 치료사와 운전강사 및 경찰이 각 1명 동반하여 직접 개조된 차량으로 도로주행평가를 실시하게 된다. 이런 평가과정을 통해 질병이나 재발이후 장애를 갖춘 사람이라 할라도 운전능력을 평가받고 그에 따른 적절한 운전보조도구를 처방받아서 다시 운전할 수 있게 된다.

결론: 질병이나 장애를 가진 사람들은 운전을 할 수 있도록 운전재활평가시스템을 제대로 갖추는 것이 무엇보다 중요하다. 적절한 운전재활 평가는 장애를 가진 자도 전문적인 운전 혹은 운전보조도구 처방 등을 통해 운전을 할 수 있도록 하여 더 나은 삶의 질을 영위할 수 있도록 할 것이다. 그러기 위해서는 장애를 가진 사람이 운전재활평가를 통해 운전이 가능하도록 법적인 제도 마련이 필요할 것이며, 운전재활서비스를 활성화시키기 위해서는 선진국의 운전재활 시스템을 참고하여 우리나라에도 작업치료사가 적절한 운전재활서비스를 제공할 수 있도록 하여야 할 것이다.

주제어: 운전재활 보조도구, 작업치료사, 호주 운전재활 서비스, 호주 운전재활법